



George C. Marshall Space Flight Center
Marshall Space Flight Center, Alabama 35812

QD-QA-004
REVISION G

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ORGANIZATIONAL INSTRUCTION

QUALITY ASSURANCE PLAN FOR IN-HOUSE MANUFACTURING AND TEST

OPR(s)

QD10, QD20, QD30,
QD40

OPR DESIGNEE

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DOCUMENT HISTORY LOG

Status (Baseline/ Revision/ Canceled)	Document Revision	Effective Date	Description
Baseline		2/19/98	
Revision	A	7/1/99	Changes made to reflect new organization code changes and/or Changes made to reflect new directives renumbering scheme and to incorporate the corrective action of NCR 266
Revision	B	2/23/00	Replace document MPG 1441.1 with MPG 1440.2, MSFC Records Management Program and delete reference to canceled document QS10-QA-007 (S&MA-CR30-QA-Y-007), Quality Assurance Controls For Fabrication, Processing, and Assembly Operations.
Revision	C	9/4/02	Format and numbering change to implement requirements of QS-A-001 rev. F
Revision	D	5/5/03	Rewritten to specifically implement MPD 1280.1, MPG1280.8, MPG 1280.9 and QS-QE-001 for QS10 coverage of Space Transportation, Space Launch Initiative, and Space Shuttle In-House projects, and Facilities Engineering Department support, and to reflect the current organization.
Revision	E	5/13/04	Update to include MSFC transition to SAE AS9100.
Revision	F	10/1/04	Revised to bring document in compliance with the HQ Rules Review Action (CAITS: 04-DA01-0387). Changes were also made to reflect S&MA organizational name changes (i.e., QS to QD), and new Test Lab organization.
Revision	G	12/16/04	Administrative change, section 8 Records to None.

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PREFACE

This plan defines the NASA MSFC In-House Quality Assurance Program as required by SAE AS9100, “Quality Systems-Aerospace-Model for Quality Assurance in Design, Development, Production, Installation and Servicing”, and MPD 1280.1, “Marshall Management Manual” for MSFC in-House space transportation, manufacturing and test activities, and the S&MA quality assurance services provided to the Facilities Engineering Department. This plan implements the requirement in QD-QE-001 for project Quality Plans and the requirements in SAE AS9100 for Customer Focus (5.2), Quality Policy (5.3) and Product Realization (7.1).

This document is the responsibility of the Advanced Projects Assurance Department (QD10). Any recommendations for revisions can be submitted to this office for consideration.

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QUALITY ASSURANCE PLAN FOR IN-HOUSE MANUFACTURING AND TEST

1. PURPOSE, SCOPE, APPLICABILITY

1.1. PURPOSE - This plan tailors the basic requirements for the implementation of NASA Quality Assurance policy as required by MPD 1280.1 and QD-QE-001, for processing, test, and inspection of space vehicle flight hardware, Research and Development (R&D) test articles, ground support equipment, and for hazardous test facility activation and operations. Projects may elect to use this plan for space vehicle manufacturing and test activities at MSFC in lieu of or in conjunction with a project specific quality plan. This plan may also be used for work performed under task agreements, Cooperative Agreements, Space Act Agreements and Center Director Discretionary Fund (CDDF) activities, and for QD10 activities associated with the Facilities Engineering Department. Parenthetical references throughout this document show the relationship to SAE AS9100 provisions as required by SAE AS 9100 paragraph 4.4.4.

1.2. SCOPE – This plan identifies Safety and Mission Assurance Office, Advanced Projects Assurance Department, Test Area Quality Assurance Team(QD12)functions and responsibilities, and associated requirements and implementing procedures, for in-house operations for space transportation. This plan also ties the requirements of MPD 1280.1 for in-house manufacturing and test activities to sub-tier procedures.

1.3. APPLICABILITY – This instruction is applicable to QD10 and the Test Lab, and may be applied to other projects and activities as described in paragraph 1.1 above.

2. DOCUMENTS (Applicable and/or Reference)

2.1. APPLICABLE DOCUMENTS -

NASA-STD-8719.9	<i>Safety Standard for Lifting Devices and Equipment</i>
NSS 1740.12	<i>Safety Standard for Explosives, Propellants and Pyrotechnics (8719.12)</i>
ISO 8402	<i>Quality Management and Quality Assurance Vocabulary</i>
MPD 1280.1	<i>Marshall Management Manual</i>
MPR 1050.1	<i>Contract (Customer Agreement) Review</i>
MWI 1050.3	<i>Policy and Authority to Take Actions Related to Reimbursable and Non-</i>

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Reimbursable Space Act Agreements

MWI 1280.4	<i>MSFC QSDN System</i>
MPR 1280.6	<i>Internal Quality Audits</i>
MPR 1280.8	<i>Customer Satisfaction</i>
MPR 1280.9	<i>Continual Improvement</i>
MPR 8715.1	<i>Marshall Safety, Health and Environmental Policy</i>
MPR 4000.1	<i>Control of Customer Supplied Product</i>
MPR 4500.1	<i>Management of Propellants and Pressurants</i>
MPR 5000.1	<i>Purchasing</i>
MPR 6410.1	<i>Handling, Storage, Packaging, Preservation and Delivery</i>
MPR 8040.1	<i>Configuration Management, MSFC Programs/Projects</i>
MPR 8730.1	<i>Inspection and Testing</i>
MPR 8730.2	<i>Inspection and Test Status</i>
MPR 8730.3	<i>Control of Nonconforming Product</i>
MPR 8730.5	<i>Control of Inspection, Measuring, and Test Equipment</i>
MPR 8823.2	<i>Pressure Systems Guidelines and Certification Requirements</i>
MWI 3410.1	<i>Personnel Certification Program</i>
MWI 5000.1	<i>Processing NASA Research Announcements (NRA's) and Cooperative Agreement Notices (CAN's)</i>

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MWI 6410.1	<i>Packaging, Handling, and Moving Program Critical Hardware</i>
MWI 8040.3	<i>Deviation and Waiver Process, MSFC Projects/Programs</i>
MWI 8715.8	<i>Operational Readiness Program</i>
MWI 8730.3	<i>MSFC Material Review System</i>
MSFC-HDBK-1630	<i>Quality Program Provisions for MSFC Test Area Contractors</i>
MSFC-SPEC-164	<i>Cleanliness of Components For Use In Oxygen, Fuel and Pneumatic Systems, Specification For</i>
MSFC-STD-126	<i>Inspection, Maintenance, Proof Testing and Certification of Handling Equipment</i>
MSFC-STD-555	<i>MSFC Engineering Documentation Standard</i>
MSFC-STD-1800	<i>Electrostatic Discharge Control for Propellant and Explosive Devices</i>
QD-QE-001	<i>Project Quality Instruction</i>
QD-QE-003	<i>Participation in Space Flight Program/Project Baseline Design Review</i>
QD-QA-003	<i>Quality Assurance Guidelines for Test Activities</i>
QD-QA-005	<i>Packaging, Handling and Moving Program Critical Hardware</i>
QD-QA-006	<i>Baselining and Certifying Test Facilities or Test Facility Systems</i>
QD-QA-009	<i>Penetrant Inspection</i>
QD-QA-012	<i>Use of Withhold Tags</i>
QD-QA-015	<i>Special Process Audit</i>

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QD-QA-018	<i>Review of Drawings and Work Authorizing Documents (WAD's)</i>
QD-QA-019	<i>Inspection of Propellant and Explosive Devices</i>
QD-QA-022	<i>Visual Weld Inspection</i>
QD-QA-024	<i>Ultrasonic Inspection</i>
QD-QA-025	<i>Eddy Current Inspection</i>
QD-QA-026	<i>Monitoring Field Cleaning Operations</i>
QD-QA-028	<i>Magnetic Particle Inspection</i>
QD-QA-029	<i>Radiographic Film Interpretation</i>
TD70-001	<i>Test Project Process</i>
TD70-003	<i>Test Preparation Sheet Instructions</i>
TD70-004	<i>Test Procedure Instructions</i>
TD70-007	<i>Facility Nonconformance Reporting System for the Technology Evaluation Department</i>
TD70-008	<i>Facility Inspection Requirements</i>
TD70-013	<i>Quality Records Center</i>
TD70-014	<i>Field Cleaning of Components, Parts, and Installed Systems</i>
TD70-015	<i>Test Readiness Review for Hazardous Operations</i>
TD70-016	<i>Deviation/Waiver Processing</i>
TD71-001	<i>Contamination Control in LOX Systems</i>
TD71-002	<i>Contamination Prevention</i>

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TD72-101 *Measurement Systems Verification Process*

ED38-OI-001 *ED38 Design Control*

ED38-OI-002 *ED38 Design Requirements*

2.2. REFERENCE DOCUMENTS

None

3. DEFINITIONS

Terms and definitions are listed in ISO 8402.

4. INSTRUCTIONS

4.1 QUALITY SYSTEM REQUIREMENTS

4.1.1 Policy - MSFC Quality Policy is defined in MPD 1280.1. (5.3)

4.1.2 Organization - The MSFC organization is described in MPD 1280.1. The Management Representative is appointed by the Center Director, as detailed in MPD 1280.1. (5.5.2) The responsibilities of the Safety and Mission Assurance (S&MA) Office for in-house activities are defined in the S&MA Office Charter. The S&MA Office, Advanced Projects Assurance Department (QD12), has established a Test Area Quality Assurance Team for the purpose of implementing the quality assurance program for in-house manufacturing and test of space vehicle components and systems. The QD12 Quality Assurance Team also provides support to the Facilities Engineering Department for approval of weld procedure and welder qualification for various contracts. (5.1, 5.2, 5.3)

4.2 QUALITY PLANNING - Where this plan is invoked, QD12 personnel shall ensure compliance with this plan and applicable NASA and MSFC requirements for R&D, qualification, and flight items. This plan may be used in conjunction with the Project Quality Plan. The S&MA organization shall ensure that quality requirements are identified and satisfied throughout the In-House phase of the project. QD12 personnel shall ensure full compliance for all safety related and fracture critical items, as well as interface requirements for flight and critical ground support equipment identified by drawing or specification. Requirements documented in the hazard analysis (HA) and failure modes and effects analysis (FMEA) will be translated into mandatory inspection points. (5.4)

The QD12 Test Area Quality Team representatives shall participate with the customer, other S&MA personnel, and test engineering personnel in establishing tailored test project quality requirements, and coordinate the implementation of these requirements. The QD12

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representatives shall perform contract monitoring functions for contracts issued in support of in-house manufacturing and test activities for space vehicles, including performance evaluations.

For R&D programs, quality assurance requirements shall be negotiated and established during the planning phase. QD12 Test Area personnel shall coordinate with the customer, other S&MA and engineering personnel, and the extent of quality assurance coverage shall be documented in a project level plan, such as a test plan, test requirements document, or implementation plan, or in the Customer Supplied Product Arrangement (CSPA). Factors such as use of data, cost, and risk shall be considered. Quality assurance functions are provided as a risk mitigation tool to ensure that one of a kind or high dollar test articles are handled properly, cleanliness is maintained, and that they are correctly installed, as a minimum, to protect the customer's investment.

QD12 involvement in MSFC test facility modification, activation, operation, and maintenance shall be in compliance with applicable codes, standards, drawings, specifications, hazard analyses and any other applicable NASA, MSFC, department and S&MA requirements documents, such as TD70-008.

The QD12 Test Area Quality Team supports other S&MA and MSFC customers upon request, in areas for which they have unique training, experience, qualifications and certifications. This may include, but is not limited to, inspection services, development of training modules, audits and surveys at MSFC and at contractor facilities, support to the Education Department, safety support, anomaly and mishap investigations, drafting or review of plans and procedures, input to strategic planning, and continuous improvement initiatives.

4.3 CONTRACT REVIEW - MSFC may enter into Space Act Agreements, Consortiums, NASA Research Announcements or other such mutually beneficial arrangements with industry. Procedures governing this process are MPR 1050.1 and MWI 1050.3. QD12 shall implement the quality assurance requirements as defined in the Agreement through application of this plan or the establishment of a project specific plan. QD12 shall participate in the proposal process as required. (7.2)

4.4 DESIGN CONTROL Test article design control shall be the responsibility of the customer, sometimes referred to as the test requesting organization. MSFC quality assurance involvement and the methods for design control shall be defined in project documentation. Test requesters or customers shall maintain control of their designs during the test activities, as required by the project. Test Facility design control falls under three MSFC organizations: the Facilities Engineering Department is responsible for maintaining design control on the core facilities, commonly termed "Brick and Mortar," the cross country piping, and propellant and pressurant storage tanks; the Special Test Equipment Design Group provides drawings and revisions for facility special test equipment, test fixtures, structural and piping modifications per ED38-OI-001 and 002; changes to ED drawings which are initiated by test personnel are documented on a Test Preparation Sheet (TPS) as described in paragraph 4.5; Test Lab control, instrumentation and mechanical drawings and schematics are controlled through the implementation of a Master

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List(these may be either electronic or non-electronic and are controlled by a designated custodian); sketches are controlled by a Test Preparation Sheet. (7.3)

Design reviews for the test article shall be performed per project requirements. Design Review for the test facility shall be an Operational Readiness Inspection (ORI) per MWI 8715.8 for new or extensively modified facilities, a Safety Review Team (SRT) for less extensive modifications, or a Facility Review for minor modifications. A Test Readiness Review (TRR) shall be held for all new test series per TD70-015 or other department instructions. The TRR agenda shall include input from the ORI, SRT, or Facility Review as appropriate. (7.3.4)

Baselining (configuration verification) of new facilities or facility modifications shall be performed per QD-QA-006. Facility Activation testing shall be performed per department instructions such as TD70-004 and TD72-101. (4.3)

Deviations and waivers for test facilities controlled by the Test Lab shall be documented on MSFC Form 847, "Deviation/Waiver Approval Request" and processed per TD70-016. (For safety waivers or variances see MPG 8715.1.) (4.3)

4.5 DOCUMENT AND DATA CONTROL - Work Authorizing Documentation (such as Test Preparation Sheets and procedures) shall be controlled per TD70-003 and 004, or other department procedures to prevent inadvertent use of unauthorized documentation by performing personnel. A master list or equivalent document control procedure shall be established, to identify the current revision. The Open Items List (OIL) maintained by TD70 is an example of an electronic data base which identifies all active TPS's and procedures. An electronic Test and Inspection Record (TAIR) book archives all open and closed TPS's. (4.2.3)

Controls shall be established to ensure that the latest revision is available to personnel performing the operations, and that obsolete documents are promptly removed from all points of issue and use. Changes to documents shall be reviewed and approved by the same functions/organizations that performed the original review and approval unless specifically designated otherwise. Where, practicable the nature of the change shall be identified in the document or the appropriate attachments.

The designated organizations shall have access to applicable background information such as drawings, or specifications. The effectivity point of documents and changes, which affect article and material fabrication, inspection, and test operations, shall be clearly specified. (4.2.3)

NASA Flight hardware configuration shall be controlled as required by the project. (4.3)

For non-flight and R&D hardware, and hardware belonging to outside customers, procedures shall be established and maintained by the test requester to control and verify the configuration to ensure that the specified requirements are met. Any QD12 responsibilities must be designated in writing. (4.3)

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4.6 PURCHASING - To ensure that quality assurance requirements are integrated into MSFC procurements, the procurements shall be processed as required by MPG 5000.1. S&MA personnel shall participate in Source Evaluation Board/Source Evaluation Committee (SEB/SEC) activities, including drafting the S&MA portion of the Statement of Work and evaluating proposals. Procurements for flight or qualification hardware or in-house support services, shall incorporate the requirements of the appropriate ISO 9000 or SAE AS9100 document. Other items or services shall be reviewed for appropriate quality and technical requirements. (7.4.1)

In-House support contractors may from time to time initiate subcontracts for items or services (e.g. tube trailer refurbishment, precision cleaning, Nondestructive Evaluation) requiring Government Source Inspection (GSI). Purchasing documentation for these items or services shall be reviewed by QD12 for inclusion of GSI requirements. Propellants and pressurants are purchased in accordance with MPG 4500.1. (7.4.2, 7.4.3)

Government Source Inspection is normally be provided through a Letter of Delegation to the cognizant Government Agency, as required by QD-QE-001. GSI may be performed by qualified QD12 personnel on a case-by-case basis, at project request, or as deemed appropriate by QD12 management. (7.4.3)

QD12 shall ensure the adequacy and implementation of the quality system in use by in-house contractors under their purview. Applicable directives and procedures contained in the MSFC Quality Assurance Plan shall be used, as well as contractor procedures. As necessary, supplemental directives or procedures shall be developed to support this plan. Audits of suppliers shall be performed in accordance with MWI 5330.1 and QD-QA-015. Input shall provided to the Performance Evaluation Board (PEB) as required by the PEB plan. (7.4.1)

4.7 CONTROL OF CUSTOMER SUPPLIED PRODUCT - Hardware belonging to other NASA centers, other Government Agencies, or Industry will be controlled per MPG 4000.1 and the customer's documented requirements. QD12 shall ensure implementation of requirements for Customer Supplied Product Arrangements (CSPA) and Customer Supplied Property Tags. Quality requirements listed on the CSPA shall be adhered to. (7.2, 7.5.4)

4.8 PRODUCT IDENTIFICATION AND TRACEABILITY - Where appropriate, procedures shall be established and maintained for identifying, inspecting, and/or testing raw materials to applicable drawings, specifications or other documents, during various stages of production, delivery and installation. (7.5)

If traceability is a specified requirement, individual product or batches shall have a unique identification. This identification shall be recorded per contractor's procedures and audited by QD12.

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Materials that do not conform or which are awaiting completion and receipt of satisfactory test results or documentation, shall be segregated and controlled to prevent use. MSFC Withhold Tags, or nonconformance documentation may be used to identify items which are nonconforming or which require additional documentation. (8.3)

4.9 PROCESS CONTROL - All flight and qualification hardware shall be processed and inspected to approved work authorizing documentation. For R&D and test facility work, QD12 personnel shall support fabrication and critical processes performed in-house through monitoring and inspections delineated in Test Preparation Sheets (TPS's), drawings and procedures and other work authorizing documents. Quality coverage shall be tailored for the individual project and agreed upon by the cognizant customer or engineering personnel. (7.1, 7.5)

QD12 personnel shall review and approve TPS's and procedures and incorporate mandatory inspection points (MIP's) per TD70-003 and TD70-008 and customer, department, drawing, code or specification guidelines. Where specific inspections are not required, the process may be monitored. (7.1, 7.5)

QD12 will support Test Area fabrication operations, including assembly, to ensure compliance with drawings, specifications, and procedures and critical processes such as welding. Where required, hardware shall be processed using cleanliness controls as defined by TD70-014, TD71-001, and TD71-002. If required, a foreign object damage and debris (FOD) program shall be established over and above the cleanliness controls. (7.1, 7.5)

4.10 INSPECTION AND TESTING - Inspection planning will be performed on flight hardware, designated ground support equipment, qualification hardware, and designated R&D hardware. Inspection planning will also be performed for test facility activation and operation, and for work performed under Space Act Agreements, Cooperative Agreements, NRAs, and CDDFs as required. Planning will incorporate requirements of Failure Mode Effects Analysis, Critical Items List (FMEA/CIL), hazard analysis, test plans, drawings, specifications, codes, requirements and consideration of the proper work environment per QD-QA-018 and TD70-008. (6.4)

QD12 shall be responsible for working with other S&MA, engineering, or customer personnel to establish inspection requirements. These requirements shall be transmitted to all QD12 Test Area Team personnel for incorporation into work authorizing documentation. Inspection results shall be documented on work authorizing documentation. (7.1)

Receiving Inspection shall be performed in accordance with QD-QA-001 by the Cargo Assurance Department/QS30. Mechanical and electrical components or assemblies are inspected in the receiving area of building 4705. If receiving inspection of large test articles or components is required at the test site, QD12 personnel shall coordinate the receiving inspection function with QD30, or perform receiving inspection as required. An explosives receiving inspection, consisting of count and condition, and adherence to Department of Transportation and safety

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regulations, is performed in the Redstone Arsenal explosives receiving area by Army personnel. More detailed inspections, if required, shall be performed in the Army explosives area, the Test Area, or other area approved by Safety, per QD-QA-019 and applicable TPS's or procedures. Receiving inspection of liquid propellants, pressurants is performed by the Propellants and Pressurants contractor. (7.4.3)

In-process inspection shall be performed in accordance with requirements defined on TPS's and procedures. Critical processes shall be monitored as required by the process procedure or customer, and as deemed necessary by QD12 personnel. Test facility welding shall be inspected per QD-QA-022. Cleaning of cross-country lines and pressure vessels shall be monitored per QD-QA-026. (7.5.1)

Nondestructive Evaluation (NDE) shall be performed by certified personnel in accordance with work authorizing documents and QD-QA-009, QD-QA-024, QD-QA-025, QD-QA-028, and QD-QA-029. When NDE is witnessed, QD12 personnel shall ensure compliance with approved procedures, and documentation of results. Test reports and radiographs shall be reviewed as a part of data package. (7.5.2)

Flight and qualification hardware shall be assembled and tested in accordance with approved procedures. Configuration shall be verified during assembly as required by the customer. Any required pretest inspections shall be performed and documented. QD12 personnel shall perform test surveillance as required by QD-QA-003 to ensure compliance with the test plan and test procedure, and that deviations or anomalies are documented and dispositioned. QD12 personnel shall also ensure closure of constraints prior to test. Post-test inspections shall be performed as required by the test plan and applicable procedures or customer request. (7.3.6)

Qualification test articles shall be monitored by QD12 to assure qualification testing is performed in accordance with test requirements, and approved test procedures. (7.3.6)

For R&D test programs, the extent of quality coverage for assembly and test of the test article shall be per customer requirements. QD12 may make recommendations for quality coverage based on use of data, cost, and risk. Inspections shall be performed per project requirements and documented on a TPS or procedure. Assembly of the test article, Facility Activation Procedures (FAP's), Facility Operation Procedures (FOP's), and Test and Checkout Procedures (TCP's) shall be monitored or surveillance performed as required by the customer, procedure or hazard analysis. Department Organizational issuances (OI's), such as TD70-001, TD70-003, TD70-004, and QD-QA-003 provide further details for test activities and implementation of requirements. (7.3.6)

Test articles which belong to industry partners, other government agencies, or other NASA centers, will be inspected if required by a negotiated agreement. The test requester shall supply the requirements. Hardware shall be controlled per paragraph 4.7 above.

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4.11 INSPECTION, MEASURING AND TEST EQUIPMENT – Control of inspection, measuring and test equipment shall be per MPR 8730.5. The MSFC Calibration Laboratory is administered by the Test Lab and is audited during internal audits, centerwide audits or audits of the contractor. QD12 personnel will ensure that tools and equipment used for testing, acceptance and critical applications are calibrated, as evidenced by a current calibration sticker. QD12 personnel shall verify that self-calibrating equipment is checked as required by the owner's manual prior to use. (7.6)

Serial numbers and calibration due dates of tools and equipment shall be noted in procedures where applicable. The recall system shall be administered by the Calibration Laboratory contractor.

Equipment shall be controlled by department or contractor procedures and audited by QD12, and QD12 will designate a Point of Contact for control of equipment assigned to the team.

Measurement systems calibration is described in department OIs.

4.12 INSPECTION AND TEST STATUS – S&MA shall implement a stamp control system in compliance with MPR 8730.2. Quality assurance personnel shall be issued stamps for the purpose of hardware and software acceptance, for acceptance of steps within a procedure or TPS, and for procedure, TPS and Discrepancy Report (DR) closure. (7.5.3)

Stamps shall be traceable to the individual performing the acceptance. Record keeping and audits shall be administered by a designated stamp control custodian.

For electronic work authorizing document systems, verifications and acceptance shall be recorded electronically and password protected.

4.13 CONTROL OF NONCONFORMING PRODUCT - Nonconformance controls for NASA flight and in-scope hardware shall be implemented per MPR 8730.3, or as required by the contract customer. Nonconformance controls shall be implemented on designated development test articles, as required by the project. Nonconformance controls are also implemented on Test Lab test facilities per TD70-007. On-site contractors shall control and disposition nonconformances in accordance with their contracts and quality plans. The MSFC requirements for recording, dispositioning, closing and maintaining records of nonconformances are outlined in the above procedures. These procedures present requirements for initiating, processing, and closing of DR's, Test Discrepancy Reports (TDR's), Squawk Tags (Squawks), and Quality Test Preparation Sheets (QTPS's). Withhold Tags shall be applied to items as required per QD-QA-012. (8.3)

Material Review Board (MRB) actions shall be conducted in accordance with the applicable quality plan or approved procedure. QD12 personnel shall participate in the MRB, as required.

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If the test article nonconformance is dispositioned by a contractor's MRB, QD12 shall participate as required by the project or contract/cooperative agreement. (8.3)

4.14 CORRECTIVE AND PREVENTIVE ACTION – Corrective and preventive action for test facility hardware shall be implemented per TD70-007. For serious or continuing deficiencies in management system compliance, a Quality System Deficiency Notice shall be processed per MWI 1280.4. On-site contractors shall use procedures approved for their contract and QD12 shall verify compliance. For the test articles, corrective and preventive action shall be performed as required by the customer. (8.5.3)

4.15 HANDLING, STORAGE, PACKAGING, PRESERVATION, AND DELIVERY - For items designated as Program Critical Hardware (PCH), the following requirements documents shall be adhered to: MPR 6410.1, MWI 6410.1, QD-QA-005, MSFC-STD-126, and NSS/GO 1740.9. Foreign Object Damage/Foreign Objects and Debris (FOD) programs shall be implemented as required by the customer. (7.5.5)

For large, high cost, or one of a kind items such as test articles or pressure vessels, which are not PCH, but which require special handling, procedures shall be written for transportation and handling that will ensure the integrity of the hardware. When requested by the responsible organization, or required by hazard analysis, QD12 personnel shall ensure compliance with approved procedures.

Solid rocket motors, propellant, and explosive devices shall be moved and handled in accordance with NSS 1740.12 and MSFC-STD-1800, and applicable procedures written to detail the specific operation and approved by the industrial Safety Department.

Flight hardware, qualification hardware, test articles, ground support equipment and precision cleaned components and assemblies shall be packaged and stored to prevent contamination and degradation. Precision cleaned items will be packaged and handled per MSFC-SPEC-164. QD12 responsibilities with respect to field cleaning operations and maintaining cleanliness are documented in QD-QA-026 for cross country or storage systems, and TD70-014 for test facilities.

QD12 shall review for concurrence, prior to release, those procedures and instructions describing the controls for handling, storage, preservation, marking, labeling, packaging, packing, and shipping operations as required. Effective implementation of these documents shall be assured through inspections, monitoring, special evaluations, and verification of certified personnel and equipment. (6.4)

4.16 CONTROL OF RECORDS – QD12 shall ensure that records of the results fabrication, processing, test monitoring/surveillance and inspection are in accordance with the requirements of department OI's, such as TD70-003 and TD70-004, and contract requirements. These records

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shall provide documented evidence, including dates and acceptance stamps, that required operations and associated inspections have been completed, verified, and accepted by the person who performed the work and the inspector, engineer and/or technician who accepted the operation. QD12 shall ensure that records are maintained as specified by the customer or department requirements. (4.2.4)

Records include but are not limited to, TPS's, hard cards, supplier data, laboratory analyses, nonconformance reports, Material Review Board (MRB) dispositions, receiving inspection records, FAP's, FOP's, calibration records, in-process and end item inspection/test records, waivers and deviations, and TCP's, test data, weld maps, NDE reports.

4.17 INTERNAL QUALITY AUDITS - The MSFC Internal Audit Program shall meet the requirements of MPR 1280.6. QD12 shall support or participate as required, and perform audits of special processes and contract monitoring mini-audits in accordance with QD-QA-015. (8.2.2)

4.18 TRAINING - Only trained and certified personnel shall perform the various tasks associated with inspection and surveillance, fabrication, assembly, test, and transportation and handling. Training and certification shall include such disciplines as mechanical inspection, electrical inspection, welding inspection, explosives inspection, NDE, program critical hardware (PCH) handling, and training/certification in the specific skill or craft. Training and certification shall be provided as needed for personnel involved in hazardous operations. Training may be obtained from an outside source, such as a private company, a university, or other government agency. Quality Assurance personnel shall ensure that personnel performing tasks requiring special training and certification are properly trained and certified as required by MWI 3410.1 or the contractor's training and certification plan.

QD12 personnel shall also be familiar with NASA, MSFC, and S&MA policy and procedures. Whenever possible, personnel will attend classes related to the fields of technology to which they are assigned. (6.2)

4.19 SERVICING - If required, the QD12 shall ensure contractors comply with the requirements of their contracts for servicing at MSFC, or that any servicing performed by MSFC is in compliance with customer requirements.

4.20 STATISTICAL TECHNIQUES - Statistical techniques such as Pareto diagrams, histograms, and other stratification and trending methods may be used as necessary to assist in performing the mission assurance function. (8.2.4)

4.21 SOFTWARE QUALITY ASSURANCE (SQA) – QD12 shall work with other S&MA or customer personnel to ensure the implementation of software requirements in accordance with QD-QA-007, and QD-QA-008, as required by the project, or applicable department or customer requirements.

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4.22 CUSTOMER SATISFACTION- QD12 personnel shall participate in the implementation of the S&MA customer satisfaction policy, as required by MPR 1280.8, and shall maintain a customer oriented approach to all activities. Customer feedback shall be reviewed and any necessary actions taken to improve service. (7.2.3, 8.2.1)

4.23 CONTINUAL IMPROVEMENT- QD12 personnel shall support the Center and S&MA continual improvement efforts as required by MPR 1280.9. Personnel shall provide recommendations for improvements, corrective action, assist with audits, and work with the customer on a daily basis to improve processes. Improvements will be tracked and forwarded to S&MA management. (8.4, 8.5)

5. NOTES

This issuance replaces QD01-QA-004B, Quality Assurance Plan For In-House Manufacturing And Test, dated 2/23/00.

6. SAFETY PRECAUTIONS AND WARNING NOTES

None

7. APPENDICES, DATA, REPORTS, AND FORMS

None

8. RECORDS

None

9. TOOLS, EQUIPMENT, AND MATERIALS

None

10. PERSONNEL TRAINING AND CERTIFICATION

See paragraph 4.18.

11. FLOW DIAGRAM

None